CLAIMS

1. Injection molding apparatus comprising:

a first array of injection nozzles, each nozzle having a melt channel and a valve pin movable within the melt channel to open and close a mold gate;

a second array of injection nozzles, each nozzle having a melt channel and a valve pin movable within the melt channel to open and close a mold gate;

a melt distribution manifold between said first and second arrays of injection nozzles and in fluid communication with the arrays of nozzles;

a first actuating assembly for displacing the valve pins of the first array of injection nozzles, comprising at least one actuator and a common linkage element driven by the actuator and linked to all of the valve pins of the first array of injection nozzles to move the valve pins in unison; and

a second actuating assembly for displacing the valve pins of the second array of injection nozzles, comprising at least one actuator and a common linkage element driven by the actuator and linked to all of the valve pins of the second array of injection nozzles to move the valve pins in unison.

2. Injection molding apparatus according to claim 1, wherein each actuator provides motive force to its respective common linkage element in the direction of movement of the valve pins of its respective array of injection nozzles.

3. Injection molding apparatus according to claim 2, wherein the actuators of the first and second arrays of injection nozzles move in opposite directions to close the gates of their respective injection nozzles.

4. Injection molding apparatus according to claim 3, wherein each valve pin has a front end adjacent the gate of its respective nozzle and a remote rear end, and the common

linkage element of each array of injection nozzles engages the rear ends of its respective valve pins.

5. Injection molding apparatus according to claim 4, wherein each of the common linkage elements comprises a yoke plate guided for reciprocation in the direction of movement of the valve pins of its respective array of injection nozzles.

6. Injection molding apparatus according to claim 5, wherein each yoke plate is guided by at least two guide members which extend in the direction of movement of the valve pins of its respective array of injection nozzles.

7. Injection molding apparatus according to claim 1, wherein each of the common linkage elements comprises a yoke plate guided for reciprocation in the direction of movement of the valve pins of its respective array of injection nozzles.

8. Injection molding apparatus according to claim 7, wherein each yoke plate is guided by at least two guide members which extend in the direction of movement of the valve pins of its respective array of injection nozzles.

9. Injection molding apparatus according to claim 8, wherein each valve pin has a front end adjacent the gate of its respective nozzle and a remote rear end, and the common linkage element of each array of injection nozzles engages the rear ends of its respective valve pins.

10. Injection molding apparatus according to claim 7, wherein each valve pin has a front end adjacent the gate of its respective nozzle and a remote rear end, and the common linkage element of each array of injection nozzles engages the rear ends of its respective valve pins.

11. Injection molding apparatus according to claim 10, wherein the actuators of the first and second arrays of injection nozzles move in opposite directions to close the gates of their respective injection nozzles.

12. Injection molding apparatus comprising:

a first array of injection nozzles, each nozzle having a gate at its front end, a remote rear end and a valve pin movable within the nozzle, the valve pin having a front end adjacent the gate to open and close the gate and a remote rear end;

a second array of injection nozzles, each nozzle having a gate at its front end, a remote rear end and a valve pin movable within the nozzle, the valve pin having a front end adjacent the gate to open and close the gate and a remote rear end;

a melt distribution manifold between said first and second arrays of injection nozzles and in fluid communication with the rear ends of the injection nozzles;

a first actuating assembly for displacing the valve pins of the first array of injection nozzles, comprising a yoke plate engaging the rear ends of all of the valve pins of the first array of injection nozzles and guided for reciprocation in the direction of movement of the engaged valve pins, and at least one actuator driving the yoke plate to move the valve pins in unison; and

a second actuating assembly for displacing the valve pins of the second array of injection nozzles, comprising a yoke plate engaging the rear ends of all of the valve pins of the second array of injection nozzles and guided for reciprocation in the direction of movement of the engaged valve pins, and at least one actuator driving the yoke plate to move the valve pins in unison.

13. Injection molding apparatus according to claim 12, wherein each yoke plate is guided by at least two guide members which extend in the direction of movement of the valve pins of its respective array of injection nozzles.

14. Injection molding apparatus according to claim 13, wherein each of the guide members comprises a fixed pin which slidably engages a mating hole in the yoke plate.

15. Injection molding apparatus according to claim 14, wherein the interface between each fixed pin and its respective hole comprises a low-friction surface.

16. Injection molding apparatus according to claim 15, wherein each actuator provides motive force to its respective common linkage element in the direction of movement of the valve pins of its respective array of injection nozzles.

17. Injection molding apparatus according to claim 16, wherein a single centrally located actuator drives each yoke plate.

18. Injection molding apparatus according to claim 16, wherein two symmetrically located actuators drive each yoke plate.

19. Injection molding apparatus according to claim 13, wherein each actuator provides motive force to its respective common linkage element in the direction of movement of the valve pins of its respective array of injection nozzles.

20. Injection molding apparatus according to claim 19, wherein a single centrally located actuator drives each yoke plate.

21. Injection molding apparatus according to claim 19, wherein two symmetrically located actuators drive each yoke plate.

22. Injection molding apparatus according to claim 1, wherein the actuators are of a type selected from the group consisting of pneumatically powered, hydraulically powered and electrically powered actuators.

23. Injection molding apparatus according to claim 22, wherein all of the actuators are of the same type.

24. Injection molding apparatus according to claim 22, wherein the actuators of the first actuating assembly are of one type, and the actuators of the second actuating assembly are of a type different from the actuators of the first actuating assembly.

25. Injection molding apparatus according to claim 1, wherein the actuators comprise fluid-driven pistons.

Sub A1 26. ~~Injection molding apparatus according to claim 1, wherein the actuators of each~~ actuating assembly flank the injection nozzles that they actuate.

27. ~~Injection molding apparatus according to claim 1, wherein the actuators of each actuating assembly are centrally located among the injection nozzles that they actuate.~~

28. Injection molding apparatus according to claim 1, wherein each of the valve pins has a driven portion engaged by its respective common linkage element and a tip end that controls melt flow through its respective mold gate, and the at least one actuator of each actuating assembly is located between the common linkage element and the tip ends of the valve pins that it actuates.

Sub A2 29. ~~Injection molding apparatus according to claim 28, comprising a plurality of~~ actuators driving each common linkage element, wherein the actuators of each actuating assembly flank the injection nozzles that they actuate.

30. Injection molding apparatus according to claim 28, wherein the at least one actuator of each actuating assembly is centrally located among the injection nozzles that it actuates.

31. Injection molding apparatus according to claim 1, wherein at least one of the injection nozzles has a plurality of melt channels and a plurality of valve pins.

32. Injection molding apparatus according to claim 1, wherein a plurality of the injection nozzles communicate with a single mold cavity.

33. Injection molding apparatus according to claim 1, wherein at least one of the injection nozzles communicates with a plurality mold cavities.

34. Injection molding apparatus according to claim 1, wherein the injection nozzles communicate with mold cavities of various types and sizes to form articles of various shapes and sizes.

35. Injection molding apparatus according to claim 1, wherein there are a plurality of separate melt distribution manifolds, and separate groups of injection nozzles communicate with separate ones of said melt distribution manifolds.

36. Injection molding apparatus comprising:

an array of injection nozzles, each nozzle having a melt channel and a valve pin movable within the melt channel, each valve pin having a driven portion and a tip end that controls melt flow through a mold gate;

a melt distribution manifold in fluid communication with the array of injection nozzles; and

an actuating assembly for displacing the valve pins of the array of injection nozzles, comprising at least one actuator and a common linkage element driven by the actuator and linked to the driven portions of all of the valve pins of the array of injection nozzles to move the valve pins in unison, wherein the at least one actuator is located between the common linkage element and the tip ends of the valve pins.

37. Injection molding apparatus according to claim 36, comprising a plurality of actuators driving the common linkage element, the actuators flanking the injection nozzles.

38. Injection molding apparatus according to claim 36, wherein the at least one actuator is centrally located among the injection nozzles.

~~39.~~ Injection molding apparatus comprising:

an array of injection nozzles, each nozzle having a melt channel and a valve pin movable within the melt channel, each valve pin having a driven portion and a tip end that controls melt flow through a mold gate;

a melt distribution manifold in fluid communication with the array of injection nozzles; and

an actuating assembly for displacing the valve pins of the array of injection nozzles, comprising at least one actuator and a common linkage element driven by the actuator and linked to the driven portions of all of the valve pins of the array of injection nozzles to move the valve pins in unison, wherein the at least one actuator is located between the melt distribution ~~manifold~~ and the tip ends of the valve pins.

~~40.~~ 38 Injection molding apparatus according to claim ~~39~~ 37, wherein the common linkage element is located between the melt distribution manifold and the tip ends of the valve pins.